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EFFECTS OF A COLLABORATIVE, TECHNOLOGY-BASED INTERVENTION INVOLVING SCHOOL PRINCIPALS TO RETAIN EARLY-CAREER TEACHERS: A SCALED, QUANTITATIVE RESEARCH STUDY

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ABSTRACT

Statistics have shown that at least 50% of all teachers leave the profession within the first five years, with higher departure rates in certain subjects (e.g. science and mathematics, special education, English language development) (Ingersoll, 2003) and in under-resourced schools with traditionally underserved students of color (Redding & Henry, 2018). Moreover, lack of administrative support is cited as a significant factor in teacher job satisfaction (Borman & Dowling, 2008; Donaldson, 2013). To investigate principal and early-career teacher attitudes regarding support, an intervention was conducted to investigate the degree that a single, brief meeting involving school principals and their early-career teachers had on feelings of support. Informing policy-makers and practitioners alike, results of this pilot study indicated that, 45 days after the intervention, teacher and principal participants reported a general increase in perceived levels of support, relative to control participants.

Keywords: *administrator, teacher, retention, intervention, survey, support, technology*

Introduction

Over the past 20 years, retaining teachers in certain subjects (e.g. science and mathematics, special education, English language development) and in low-resourced schools serving disadvantaged students has been a challenge for school district leadership (Carver-Thomas & Darling-Hammond, 2017; Fantilli & McDougall, 2009; Ingersoll, 2003; Kraft & Papay, 2014; Redding & Henry, 2018). Many early-career teachers are assigned to courses which serve higher percentages of minoritized students in courses for which they are not adequately trained (Ingersoll, 2002). District office spending on teacher replacement, estimated at approximately $20,000 or more for each teacher in urban schools (Sutcher et al., 2019) could be reallocated for instructional materials, salary increases, enhancement of facilities, professional development and community outreach. Moreover, lack of administrative support is cited as a significant factor in teacher job satisfaction (among others, such as inadequate pay and job stress). Early-career teachers, defined for the purposes of this paper as those serving in first two years in the profession, require a great deal of support from their administrators as they assume the responsibilities of the profession. Administrative support can take many forms, from the purchasing of instructional resources, to addressing disciplinary issues with particular students, to serving as a "buffer" between novice teachers and unreasonable parents, to simply providing moral support for these teachers.

Although many early-career teachers are provided additional professional development in the form of targeted induction/mentoring, these supports are generally focused on curriculum, instruction, and assessment and rarely—if ever—on specific strategies that teachers can use to collaborate more effectively with administrators in their schools (Smith & Ingersoll, 2004). Many site principals struggle to fill teacher vacancies at their schools and are limited to mentor those they do find (Guarino et al., 2004). The intervention used in this study requires no specific training for the administrator and takes only ten minutes to implement, with no additional cost to the schools.

Researchers involved in this study implemented an intervention to investigate the degree to which a single, brief meeting (referred to from this point forward as a "Ten-Minute Meeting, or TMM) involving school principals and their early-career mathematics teachers had on feelings of support and job satisfaction. These Ten-Minute Meetings required that principal-teacher pairs watch a video highlighting best teaching practices on effective classroom discourse and, after watching the video, engage in a focused conversation about the degree that the highlighted strategies were used in the teachers' classrooms. Results of this pilot study indicated that, 45 days after the intervention, teachers and principals that had participated in the activity reported an increase in perceived levels of support, relative to control participants.

Literature Review

Substantive research in the past fifteen years highlights the increase in teachers leaving the teaching profession within the first few years of their careers (Ingersoll & Strong, 2011). Moreover, Science, Technology, Engineering and Mathematics (STEM) teachers and those serving students in urban schools with limited resources are departing at even higher rates than national averages (Carver-Thomas & Darling-Hammond, 2017; Fantilli & McDougall, 2009; Goldring et al., 2014). Early-career teachers cite lack of support from school administrators as a major reason for their decision to leave the profession (;Borman & Dowling, 2008; Boyd et al., 2011); Donaldson, 2013; Hanselman et al., 2016; Ingersoll & Strong, 2011; National Commission on Teaching and America's Future, 2002). Ladd (2011), for instance, explains, "...teachers' perceptions of working conditions at the school level are highly predictive of an individual

teacher's intentions to leave a school, with the perceived quality of school leadership the most salient factor" (p. 253).

Many teachers also have expressed feeling pressure from administrators to perform well on standardized tests, which might factor into teachers' leaving the profession (California Mathematics Project, 2012; Carver-Thomas & Darling-Hammond, 2017; Podolsky et al., 2016; Tye & O'Brien, 2002). In an evaluation of teachers in Georgia who left teaching in the first five years, Owens (2015) reported that "teachers overwhelmingly list standardized tests…as reasons (Georgia) loses so many educators in a short period of time" (p. 3).

A majority of literature published in peer-reviewed journals since 2000 that focused on the connection between school administrators and teacher satisfaction; these studies effectively made use of quantitative analyses of large datasets furnished by the National Center for Education Statistics (NCES) (Carver-Thomas & Darling-Hammond, 2017; Djonko-Moore, 2012, 2016; Grissom, 2011; Ingersoll, 2003; Ronfeldt & McQueen, 2017; Tickle et al., 2011). These studies investigated responses to survey questions by a nationally representative sample of participants who completed the NCES Schools and Staffing Survey (SASS), the Teacher Follow-Up Survey (TFS), and/or the Principal Follow-up Survey (PFS). Other researchers confined their investigations to data collected in certain states, like Georgia, Texas, North Carolina, Florida, Tennessee, Maryland, Colorado (Gates et al., 2019; Grissom, 2019; Ladd, 2011; Redding & Henry, 2018) and large cities like New York, Washington, D.C., Los Angeles and Chicago (Boyd et al., 2011; Dee & Wyckoff, 2013; Hanselman et al., 2016; Jacob, 2013). To a much less degree, peer-reviewed qualitative research completed since 2000 that investigates the administrator's effect on teacher retention (Donaldson, 2013; Johnson & Birkeland, 2003; Lochmiller, 2016; Mawhinney, 2008; Painter, 2000; Robinson, 2017; and Schaefer, 2013) has employed interviews, surveys with open-response questions, and observations. There is a lack of peer-reviewed literature, however, which makes use of data collected as a result of interventions involving teachers and principals.

Theoretical Framework

The theoretical framework for this study is organizational commitment theory (Meyer & Allen, 1991). The authors describe three main themes of organizational commitment as: (a) needs, values and work experiences of the employee (affective commitment), (b) recognition of the cost(s) associated with employees leaving an organization (continuance commitment), and (c) recognition of the importance of employees remaining at the work site (normative commitment). The degree that school administrators support professionals (i.e. teachers) at their site connects to all three themes. A prominent research study that included a nationally representative group of teachers (Djonko-Moore, 2012), found that "teacher control in the classroom and administrative…support significantly decreased the odds of teacher dissatisfaction" (p. 8). Serving as an example of all three themes of organizational commitment, a school administrator who promotes autonomy in the classroom, enhances work experiences, decreases the potential for teachers to leave the profession, and recognizes that emphasizing autonomy will increase the stability of the teaching force at the school. Figure 1 below describes factors that affect organizational commitment theory, based on the framework formulated by Meyer and Allen (1991).

Figure 1. Organizational Commitment Theory (Meyer & Allen, 1991)

Methods

There were two research questions for this study, both of which relate to the effects of the previously described Ten Minute Meeting (TMM) involving early-career teachers and their principals. They were: (1) to what degree will a TMM affect teachers' feelings of being supported by their site principal, and (2) to what degree will a TMM affect principals' feelings about the degree to which they support teachers at their school sites? The hypothesis for the first research question was that TMMs will substantively improve teachers' feelings of being supported by their principal, and the hypothesis for the second research question was that TMMs will substantively improve principals' feelings about the degree to which they support teachers at their school sites.

This study used a quantitative approach that gathered data from pre-and post-intervention surveys and an experimental research design involving randomly selected intervention and control participants. Members of the research team recognized that any proposed intervention would need to take into account that teachers and administrators, in general, are limited in terms of unstructured time. Therefore, the research team promoted intervention ideas which: (a) would not overly burden the participants with regard to time and effort, and (b) would include a monetary incentive (i.e. gift card) to encourage participation in the study. The researchers devised an intervention that paired early-career mathematics teachers with their site principals to engage in a ten-minute, in-person collaborative meeting held in the teacher's classroom that focused on specific ways to increase teaching effectiveness.

After securing a letter of support from a school district, researchers gained approval from an Institutional Review Board prior to participant selection. A pre- and post-intervention survey and associated Ten Minute Meeting (TMM) intervention were created by the research team to investigate ways that school administrators could increase retention among first- through third-year secondary mathematics teachers. The intervention required that principal-teacher pairs watch a five-minute video highlighting best mathematics teaching practices and afterwards, engage in a five-minute conversation about the degree that the strategies presented were used in the teachers' classrooms. A detailed, PowerPoint presentation, embedded with the video and other instructions, led the study participants through the in-person, collaborative session. The meeting was arranged by the teacher during a time when it was convenient for the principal, and when both parties had confidence that they would not be interrupted. The pre-meeting surveys were administered within a week of the in-person meetings, and the post-meeting surveys were taken 45 days after the in-person meetings.

Setting

Gamma School District (GSD) is a public school district in the Southeast United States, serving students in a city named Arborville which has a metropolitan population of approximately 200,000 persons.[1] With a mix of urban, suburban, and rural communities, Arborville is home to families with a variety of socioeconomic statuses. The racial composition of the city is approximately 75% white, 20% African American, and 5% Hispanic with fewer percentages of Native American, Asian, and Pacific Islander residents. Although there are a number of private and parochial schools in Arborville, the GSD serves the majority of the city's residents. Over ninety schools serve almost 60,000 students in elementary, middle, and high school settings, as well as adult learning centers. The GSD employs over 8,000 professionals, half of whom are classroom teachers with the other half administrators, district office management, certificated and classified/hourly staff.

Recruiting

For simplicity, the research team decided that the school principal would serve as the administrator participant, regardless if that person evaluated the early-career teacher participant. Teachers were restricted to those who taught middle and high school mathematics as there are a number of references in the literature that highlighted the urgency to retain teachers in this subject area. To initiate the recruiting of participants, GSD's Mathematics Supervisor determined which of the 18 middle and high schools had at least two early-career mathematics teachers. The supervisor then sent an email to the principals and early-career (i.e. first and second year) mathematics teachers at these schools, outlining the research study and encouraging participation. Interested teachers and principals contacted the study's principal investigator (PI) by email, expressing their intent to participate. The PI grouped all potential participants by school, and if there were fewer than two early-career mathematics teachers interested in participating from a single site, the site was excluded from the study. If the principal and two teachers at the same site expressed an interest, that school was automatically selected as a study site. If the principal was interested in participating in the study and more than two teachers expressed an interest, the PI randomly drew teacher names, selecting an intervention teacher, and designating the other teacher(s) as control participant(s).

Participants

At the end of the recruiting process, only three schools (out of 18) including seven teachers met all criteria with at least two early-career mathematics teachers and their site principal expressing interest in participating. Although limited in size, the participant group met the study goal of implementing a targeted intervention as a "proof of concept." All the teacher participants were female, and two of the three principal participants were male. The range of ages for the teacher participants was between twenty-two and twenty-six years, and the range of ages for the principal participants was between forty-two and sixty years.

All the teacher participants were in their first or second year of teaching mathematics at the secondary school level. Table A provides the participant and school names (pseudonyms), each participant's sex and age, and specific roles at their schools. For the teacher participants, the table also designates whether the teacher participated as the intervention teacher or a comparison teacher, as well as number of years of experience as a teacher.

Table A

Study participant demographic information

Participant Name (pseudonym)	School Name (pseudonym)	Role at School	Intervention or Comparison	Sex	Age	Years of Experience as Math Teacher
Meredith	Back Bay M.S.	Teacher	Intervention	Female	25	1
Sharon	Back Bay M.S.	Teacher	Comparison	Female	23	<1
Mason	Back Bay M.S.	Principal	N/A	Male	42	0
Khloe	Harbor H.S.	Teacher	Intervention	Female	25	1
Kerri	Harbor H.S.	Teacher	Comparison	Female	26	<1
Susan	Harbor H.S.	Principal	N/A	Female	60	21
Esther	Ocean M.S.	Teacher	Comparison	Female	23	<1
Angela	Ocean M.S.	Teacher	Comparison	Female	22	<1
Sasha	Ocean M.S.	Teacher	Intervention	Female	25	<1
Chris	Ocean M.S.	Principal	N/A	Male	47	3

Instrument

The research team developed survey questions that allowed the participants to express feelings of being supported (from the teachers' perspectives) and feelings of serving as a supporter (from the principals' perspectives). Questions were based on the review of previously administered pilot studies, with a particular emphasis on determining the degree that the 10-minute, in-person collaborative meeting between the mathematics teacher and principal had on perceptions of being supported (teachers) and of supporting (principals). It was decided that for comparison purposes, the survey questions included in the pre-meeting survey would be the same as those in the post-meeting survey (except for demographic questions which would only be included in the pre-surveys). The initially crafted survey questions were further revised by members of the research team during online, collaborative meetings in the fall of 2018. Additionally, draft questions were provided to educational researchers, secondary mathematics teachers, and school administrators known by the researchers who served as objective evaluators of the content. These reviewers provided suggestions for edits to the initially developed questions, many of which were incorporated into the final version. After all revisions were completed, the early-career teacher survey included 16 questions, and the principal survey included 14 questions.

For ease of access, the surveys were converted to electronic form, using the Qualtrics™ computer application. Pre-meeting surveys were taken by study participants within a week of the in-person meeting, and the post-meeting surveys were taken 45 days after the in-person meetings. Besides the teacher-principal pair who were involved in the intervention, at least one early-career mathematics teacher at each school site was included as a control participant. These teachers, who took part in normal interactions with their mathematics department colleagues and school administrators, did not participate in the intervention meeting with the principal but completed the pre- and post-meeting surveys for comparison. Data collected from the Qualtrics™ computer application were downloaded into Microsoft™ Excel, analyzed, and converted into descriptive tables.

Video

After a search of both online and commercially available productions, the research team decided to utilize an open-source video entitled "Encouraging Debate," based on content and length. This open-source, five-minute video contains teacher and student interviews, as well as footage of actual classroom interactions, promoting the importance of increasing discourse among students during mathematics lessons, where the teacher serves as a facilitator to these discussions (Learning Media Service, 2018).

Findings

The pre- and post-intervention surveys, while limited in terms of sample size, revealed the degree to which: (a) teacher participants felt supported by their principals and (b) principal participants felt they supported their teachers. In the post-intervention surveys, all seven teacher and three principal participants stated that there were no unusual events (aside from the intervention related to this study) that affected their feelings of being supported (teachers) and providing support (principals).

Overall, the results revealed a "ceiling effect," showing little change between the pre- and post-survey responses for both teachers and principals. For example, principal participant responses varied little in the degree that they felt they were interested in the personal lives of teachers in their school and were even more consistent in their understandings of what best instruction "looks like," regardless if they had: (a) prior educational coursework in mathematics or (b) had taught mathematics prior to becoming an administrator. Survey responses from teachers showed a connection to administrative careers, stating consistently that advancement opportunities (i.e. administrative openings) factored prominently with their decision to remain in the profession. Detailed accounts of select questions follow, which compare results between pre- and post-survey responses. These results are descriptive in nature, as the sample size was insufficient to establish inferential statistical correlations.

Principal Results

In comparing the pre-survey to the post-survey, two of the three principals (66%) in the study increased the level (from "agree" to "strongly agree") that they felt they "provide(d) teachers the support they need." With regard to the principals' feelings that they "take time to recognize the work teachers do," all three principals agreed to this statement on the pre-survey. One principal (Chris) expressed an increase between the pre- and post-intervention survey, (from "agree" to "strongly agree") in his response to the statement "I provide teachers the support they need," while the others two principals remained the same in their responses. Table B highlights these results.

Table B

Principal pre-and post-survey results for survey questions 1(b) and 1(f).

Principal (pseudonym)	Pre-Survey Response I provide teachers the support they need.	Post-Survey Response I provide teachers the support they need.	Pre-Survey Response I take time to recognize the work teachers do.	Post-Survey Response I take time to recognize the work teachers do.
Mason	Agree	Strongly Agree	Agree	Agree
Susan	Agree	Agree	Agree	Agree
Chris	Agree	Strongly Agree	Agree	Strongly Agree

One of three (33%) principal participants (Mason) also revealed a marked increase in efficacy as an instructional leader, from "disagree" to "agree," when stating the degree that he "consider(ed) (him)self an effective instructional leader." Others remaining the same, it was surprising that one principal (Chris) who participated in the intervention expressed a decrease between the pre- and post-intervention survey, (from "strongly agree" to "agree") in his response

to the statement "I communicate regularly with teachers in my school." These results are provided in tabular form in Table C.

Table C
Principal pre-and post-survey results for survey questions 1(a) and 1(c).

Principal (pseudonym)	Pre-Survey Response I consider myself an effective instructional leader.	Post-Survey Response I consider myself an effective instructional leader.	Pre-Survey Response I communicate regularly with teachers in my school.	Post-Survey Response I communicate regularly with teachers in my school.
Mason	Disagree	Agree	Agree	Agree
Susan	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
Chris	Agree	Agree	Strongly Agree	Agree

Other differences were evident in the principal participant pre- and post-intervention survey responses. For example, one of three (33%) of the principal participants (principal Susan from Harbor High School) increased in the degree, from "agree" to "strongly agree", to which "(she) value(d) teacher input," while the others remained in "strong agree(ment)." In addition, this same principal increased the degree that she "provide(d) meaningful feedback to teachers in (her) school." Results for these two questions are shown in Table D.

Table D
Principal pre-and post-survey results for survey questions 1(e) and 1(g).

Principal (pseudonym)	Pre-Survey Response	Post-Survey Response	Pre-Survey Response	Post-Survey Response
	I value teacher input.	I value teacher input.	I provide meaningful feedback to teachers in my school.	I provide meaningful feedback to teachers in my school.
Mason	Strongly Agree	Strongly Agree	Agree	Agree
Susan	Agree	Strongly Agree	Agree	Strongly Agree
Chris	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree

Teacher Results

Similarly, responses in both the pre- and post-intervention survey questions posed to teachers showed discrepancies evidenced in principal survey responses. With regard to teachers, however, it is important to distinguish between responses expressed by teachers who participated in the intervention and responses by those who did not (i.e. "comparison" teachers). As examples, teacher survey responses to "my principal supports the work I do" and "my principal appreciates my efforts" are included in Table E. All teachers responded, both in the pre-survey and post-survey that they either "agree(d)" or "strongly agree(d)" with both statements. However, while all the study comparison teachers expressed the same level of support to the statement "My principal supports the work I do," one of the three (33%) intervention teachers (Meredith) responded with increased affirmation, from "agree" to "strongly agree," to this statement in her post-survey. With regard to the perception that the site principal appreciated teacher efforts, one of the three (33%) intervention teachers (Sasha) responded with increased affirmation, from "agree" to "strongly

agree," while one of the four (25%) comparison teachers (Sharon) changed her response on the post-survey from "strongly agree" to "agree."

Table E
Teacher pre-and post-survey results for survey questions 1(a) and 1(d).

Teacher [pseudonym] (I=Intervention; C=Comparison)	Pre-Survey Response	Post-Survey Response	Pre-Survey Response	Post-Survey Response
	My principal supports the work I do.	My principal supports the work I do.	My principal appreciates my efforts.	My principal appreciates my efforts.
Meredith (I)	Agree	Strongly Agree	Strongly Agree	Strongly Agree
Khloe (I)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
Sasha (I)	Strongly Agree	Strongly Agree	Agree	Strongly Agree
Sharon (C)	Agree	Agree	Strongly Agree	Agree
Kerri (C)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
Angela (C)	Agree	Agree	Agree	Agree
Esther (C)	Agree	Agree	Agree	Agree

Other survey questions revealed the degree to which teacher participants, whether they be those who collaborated with their principals in the intervention or not, felt that their principal "(communicated) with (them) regularly" or "(valued their) input." Detailed results for teacher participants are included in Table F. While six of the seven teachers responded with the same level of agreement (stating they agreed or strongly agreed) on the pre-intervention survey and the survey administered 45 days afterward, one intervention teacher (Khloe) increased her response from "agree" to "strongly agree."

A similar result was seen when the teachers were asked to express the degree to which "(their) principal (valued their) input." Again, six of the seven teachers responded with the same level of agreement (stating they agreed or strongly agreed) on the pre- and post-intervention surveys. However, comparison teacher Sharon, who did not participate with her principal in the collaborative intervention, responded with "agree" on the pre-intervention survey and "disagree" on the post-intervention survey. The degree that Sharon was envious of the attention given by her principal (Mason) to the intervention teacher (Meredith) as a result of the intervention was not measured. It is interesting to note that Sharon responded to the post-survey question, "Approximately how many interactions (personal, electronic, etc.) did you have with the principal REGARDING MATHEMATICS INSTRUCTION[2] (during) this study?" with "none."

Table F
Teacher pre-and post-survey results for survey questions 1(b) and 1(c).

Teacher [pseudonym] (I=Intervention; C=Comparison)	Pre-Survey Response	Post-Survey Response	Pre-Survey Response	Post-Survey Response
	My principal communicates with me regularly.	My principal communicates with me regularly.	My principal values my input.	My principal values my input.
Meredith (I)	Agree	Agree	Agree	Agree
Khloe (I)	Agree	Strongly Agree	Strongly Agree	Strongly Agree
Sasha (I)	Agree	Agree	Agree	Agree
Sharon (C)	Agree	Agree	Agree	Disagree
Kerri (C)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
Angela (C)	Agree	Agree	Agree	Agree
Esther (C)	Agree	Agree	Agree	Agree

Surveys constructed for this study included questions that investigated the degree to which teachers felt their principals "care(d) about (them)" and "(were) aware of (their) outside interests." As with other survey questions for teachers in the study, there was near-perfect alignment of responses between the pre- and post-intervention surveys. Teachers consistently "agreed" or "strongly agreed" that their principals "care(d) about (them)," with one notable exception (Angela)--a comparison teacher who increased her level of agreement from "agree" or "strongly agree." It is important to be reminded that Angela, along with all other teachers in the study, stated that during the study, "(there were no) unusual event(s) not associated to this study that affected the way that (they felt) supported by your principal."

In terms of the degree that the teacher participants felt that "(their) principals (were) aware of (their) outside interests," responses from all participants were either expressed as "agree" or "disagree," with no "strong" associations recorded. There were only two instances where teachers changed their responses between the pre- and post-survey administrations. One of the study's intervention teachers, Sasha, disagreed with this statement on the pre-intervention survey, while agreeing on the post-intervention survey. On the other hand, comparison teacher Kerri agreed with this statement on the pre-intervention survey, while disagreeing on the post-intervention survey. Detailed results for these questions are included in Table G.

Table G

Teacher pre-and post-survey results for survey questions 2(b) and 2(c).

Teacher [pseudonym] (I=Intervention; C=Comparison)	Pre-Survey Response	Post-Survey Response	Pre-Survey Response	Post-Survey Response
	My principal cares about me.	My principal cares about me.	My principal is aware of my outside interests.	My principal is aware of my outside interests.
Meredith (I)	Agree	Agree	Disagree	Disagree
Khloe (I)	Strongly Agree	Strongly Agree	Agree	Agree
Sasha (I)	Agree	Agree	Disagree	Agree
Sharon (C)	Agree	Agree	Agree	Agree
Kerri (C)	Strongly Agree	Strongly Agree	Agree	Disagree
Angela (C)	Agree	Strongly Agree	Agree	Agree
Esther (C)	Agree	Agree	Disagree	Disagree

Two additional questions on the pre- and post-intervention surveys, both related to teacher efficacy, resulted in teachers either "agree(ing)" or "disagree(ing)," with no "strong" associations recorded. These tightly aligned responses were expressed by teachers when asked to respond to the degree to which each felt they "think of (themselves) as an effective math teacher" and "sometimes doubt (their) ability to teach math." Results for these two questions are included in Table H. All but one teacher participant agreed that they "think of (themselves) as…effective math teacher(s)," both on the pre- and post-intervention surveys. The one change noted was with comparison teacher Sharon, who stated she agreed with the statement in the pre-intervention survey but disagreed 45 days later on the post-intervention survey.

In responding to the statement "I sometimes doubt my ability to teach math," five of the seven teachers had alignment with their pre- and post-intervention surveys. Two of the three intervention teachers and one of the three comparison teachers consistently disagreed with this question. In contrast, two of the four comparison teachers agreed with this statement. Of the teachers whose assessment changed, Meredith, an intervention teacher, originally stated she agreed with her assertion that she "sometimes (doubted her) ability to teach math" but then disagreed in responding to the same statement 45 days later on the post-intervention survey. The degree that this study's intervention contributed to this change in perspective for this teacher was not assessed. In contrast, comparison teacher Sharon originally stated that she disagreed that she "sometimes (doubted her) ability to teach math" but later agreed with this statement. Again, it would be speculative to assert that participating in the study's intervention would have affected Meredith's post-intervention survey response.

Table H

Teacher pre-and post-survey results for survey questions 3(a) and 3(c).

Teacher [pseudonym]	Pre-Survey Response	Post-Survey Response	Pre-Survey Response	Post-Survey Response
(I=Intervention; C=Comparison)	I think of myself as an effective math teacher.	I think of myself as an effective math teacher.	I sometimes doubt my ability to teach math.	I sometimes doubt my ability to teach math.
Meredith (I)	Agree	Agree	Agree	Disagree
Khloe (I)	Agree	Agree	Disagree	Disagree
Sasha (I)	Agree	Agree	Disagree	Disagree
Sharon (C)	Agree	Disagree	Disagree	Agree
Kerri (C)	Agree	Agree	Disagree	Disagree
Angela (C)	Agree	Agree	Agree	Agree
Esther (C)	Agree	Agree	Agree	Agree

Finally, in the post-intervention survey, teachers who participated in the collaborative intervention with their principals were asked to "… (indicate) your perceived change in support from your principal as a result of your collaborative (video watching and discussion) session." These intervention teachers were provided the following options to respond to this question: (a) greatly improved, (b) improved, (c) neither improved or diminished, (d) diminished, and (e) greatly diminished. In contrast to a majority of their responses to other questions on the surveys that revealed an increase in feelings of support, collaboration, and efficacy, all three responded to this question with "neither improved nor diminished."

Discussion and Limitations

Overall, the experimental design of the study allowed the researchers an opportunity to measure the degree to which a ten-minute intervention involving early-career teachers and their principals affected their feelings of support. As a pilot study, the number of participants was small—seven teachers and three principals—a manageable group for the researchers to study in detail. In terms of measured change, the results of this study showed slight, but meaningful, differences between the pre-intervention and post-intervention responses expressed by teacher and principal participants. Results revealed that at least one of three principals expressed an increase in the degree to which they provided support to and recognized the work of teachers, as well as how much they valued teacher input and provided meaningful feedback to their teachers. Additionally, with few exceptions, teachers who participated in the study's intervention increased their feelings about being supported by their principals.

In terms of the theoretical framework used in this study, our data support two of the three main themes of Meyer & Allen's Organizational Commitment Theory (1991), namely the affective and normative commitments. The affective commitment, associated to the needs, values and work experiences of the employee, was affirmed by participant increases in feelings associated to survey questions related to "[administrator] valuing [of] input" and "[administrator] knowing [them] as (people) and caring about (them)". The normative commitment, connected to recognizing of the importance of employees remaining at the work site was demonstrated by participant increases in survey questions related to "[administrators] supporting and appreciating work", "[their] professional strengths [being] utilized at work" and "connect[ions] to…teaching colleagues at school". The continuance commitment, which is associated to the recognizing the cost(s) associated with employees leaving an organization, was not directly demonstrated by the results of this study, but is expressed, both qualitatively and quantitatively in related research (Sutcher et al., 2019; Schaefer, 2013) and was used as motivation by the research team to conduct this study.

Although all teacher and principal participants reflected that there were no unusual events (aside from the intervention related to this study) that affected their feelings of support between the times they responded to the pre- and post-intervention surveys, it is reasonable to assume that there could have been any number of confounding factors external to the study that could have affected their responses (e.g. gender/ethnicity similarities/differences between the administrator and teacher participants, personal events, day/time surveys were taken). All survey questions employed the use of Likert scales with four distinct, but limited, intervals (strongly disagree, disagree, agree, and strongly agree). Increasing the number of Likert scale intervals in future administrations of these surveys would provide a more granular view of the differences in feelings expressed by participants. Forty-five days between the pre- and post-survey administrations may have also diminished the desired effect of the collaborative meeting, reducing the effect over time. For this study, effects that disappear over short periods of time (i.e. less than a week) were not of interest to the researchers.

After incorporating minor changes to the participant surveys used in this pilot study, the researchers have secured a much larger group of early-career teachers and their principals from other school districts in another state (approximately 500 teachers and 200 principals), allowing the researchers the opportunity to more precisely study the effects of this study's intervention. The long-term, aspirational goal is to formalize and provide access to readily available and easily implemented, technology-based interventions that effectively retain teachers through substantive teacher-principal collaborations.

Due to the limited number of participants and the demographic qualities of the schools they served in, certain factors could not be investigated within the constraints of this study. For example, a larger sample could provide the basis for investigating variations of the intervention on participant race, age, sex, years of experience teaching, and the like. These factors, as well as other dispositional qualities of participants, could have an effect on the degree that collaborative interventions of this type would be impactful on feelings of support. More importantly, including a greater range of schools which serve more diverse student populations has the potential to inform the degree to which collaborative, technology-based interventions affect attitudes of support for teachers and administrators serving students from varied racial, ethnic, and socioeconomic status schools. In addition, the effects of having principals and their teachers view video presentations focused on topics not associated with classroom discourse (e.g. equity/social justice, classroom management), but still of interest to both parties, would be of interest. Finally, areas for further study include investigating the effects of having non-teaching staff (e.g. office managers, counselors, health technicians, custodians, librarians, campus supervisors), participate in a ten-minute meeting with their site principals.

Conclusions

This study, while limited in scope, provided an opportunity for researchers to determine the degree to which a single, brief meeting involving school principals and their early-career mathematics teachers had on participant feelings of support and job satisfaction. Teachers and principals participating in the activity reported an overall increase in perceived levels of support, relative to control participants. In terms of methods and instruments, the three research design goals were met, namely: (a) the study tested an intervention that could be applied without on-site supervision by the researchers; (b) the study involved personal interactions with the early-career teacher and their principals; and (c) the intervention incorporated a design that could be scaled to a larger population.

This exploratory case supported two of Meyer & Allen's Organizational Commitment Theories (1991), namely the affective and normative commitments which are connected to employee needs, values and work experiences, as well as the importance of retention in the profession. In addition, there are a number of advantages in having formulated a research design which combines an electronically administered pre- and post-survey that measured aspects of support with a collaborative, technology-based intervention that is not overburdensome to teacher and administrator participants. The most significant of these, in the estimation of the researchers, is the ability to scale this intervention to larger populations, which would allow for more detailed investigations to measure the degree that brief, content-focused collaborations involving teachers and administrators can increase feelings of support and retention.

NOTES

[1] To protect the identity of the study participants, Gamma School District (GSD) and Arborville are pseudonyms.
[2] Capitalized for emphasis.

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Appendix A – Teacher Survey Questions

1. For each of the following statements, PRINCIPAL refers to the administrator most responsible for evaluating your work. Please click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
My principal supports the work I do.	O	O	O	O
My principal communicates with me regularly.	O	O	O	O
My principal values my input.	O	O	O	O
My principal appreciates my efforts.	O	O	O	O
I have the resources necessary to do my job well.	O	O	O	O

2. For each of the following statements, click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
My principal knows me as a person.	O	O	O	O
My principal cares about me.	O	O	O	O
My principal is aware of my outside interests.	O	O	O	O

3. For each of the following statements, click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
I think of myself as an effective math teacher.	O	O	O	O
I am successful at communicating math concepts to students.	O	O	O	O
I sometimes doubt my ability to teach math.	O	O	O	O
I have a strong background in mathematics.	O	O	O	O
I sometimes struggle to find the right teaching strategy.	O	O	O	O

4. For each of the following statements, click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
At the school where I teach, I feel like part of a team.	O	O	O	O
My professional strengths are utilized at work.	O	O	O	O
I feel connected to my teaching colleagues at school.	O	O	O	O
My work gives me a feeling of professional accomplishment.	O	O	O	O
I am satisfied with my job.	O	O	O	O
I would recommend my school as a good place to work.	O	O	O	O

5. For each of the following statements, click the column which indicates your level of agreement.

	Always	Often	Seldom	Never
I feel overwhelmed at work.	O	O	O	O
Teaching is stressful.	O	O	O	O
There isn't enough time in the day to do what I need to do.	O	O	O	O
I think about quitting teaching.	O	O	O	O

6. When you think about whether you will remain in the teaching profession, how important is each of the following to your decision? Rank them from most important (top) to least important (bottom).

_____ Salary
_____ Job satisfaction
_____ Connection to colleagues
_____ Support from administration
_____ Love of subject matter
_____ Desire to work with young people (students)
_____ Advancement opportunities
_____ Lack of other career options
_____ Status of teaching as a profession
_____ Workload

7. With which gender identity do you most identify?

- O Female
- O Male
- O Transgender female
- O Transgender male
- O Gender variant/non-conforming
- O Other (please specify) _____
- O Prefer not to answer

8. What is your age in years?

	0 10 20 30 40 50 60 70 80 90 100
Age	

9. Are you of Hispanic, Latino, Or Spanish origin?

- O Yes
- O No

10. What is your ethnicity? Check all that apply.

- ☐ American Indian or Alaskan Native
- ☐ Black or African American
- ☐ Native Hawaiian or other Pacific Islander
- ☐ Asian American/Asian
- ☐ White
- ☐ Other _____

11. What is your highest level of education so far?

O Bachelors

O Masters

O Specialist

O Doctorate

12. Do you have a degree in mathematics (that is, a full major in math)?

O Yes

O No (Please specify your undergraduate major field.) _____

13. How many years of grades 6-12 math teaching experience do you have?

_____

14. Please complete the following: I teach in a city/town whose population is...

O Greater than 500,000.

O Greater than 100,000 but less than 500,000.

O Greater than 50,000 but less than 100,000.

O Greater than 15,000 but less than 50,000.

O Less than 15,000.

15. At what grade level do you teach mathematics? (Check all that apply.)

☐ 6th

☐ 7th

☐ 8th

☐ 9th

☐ 10th

☐ 11th

☐ 12th

16. In what type of school do you teach?

- O Public
- O Private non parochial
- O Parochial
- O Charter
- O Other (please specify) _____

Appendix B – Principal Survey Questions

1. Please click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
I consider myself an effective instructional leader.	O	O	O	O
I provide teachers the support they need.	O	O	O	O
I communicate regularly with teachers in my school.	O	O	O	O
I solicit teacher input in decision making.	O	O	O	O
I value teacher input.	O	O	O	O
I take time to recognize the work teachers do.	O	O	O	O
I provide meaningful feedback to teachers in my school.	O	O	O	O

2. For each of the following statements, click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
I make an effort to get know the teachers at my school.	O	O	O	O
I value my relationships with the teachers at my school.	O	O	O	O
I take an interest in the personal lives of teachers at my school.	O	O	O	O

3. For each of the following statements, click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Unable to Judge
Math teachers at my school utilize effective strategies for teaching math.	O	O	O	O	O
Math teachers at my school need more professional development in instructional practice.	O	O	O	O	O

4. For each of the following statements, click the column which indicates your level of agreement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
I know what effective math instruction looks like.	O	O	O	O
I am familiar with current best practices for teaching math.	O	O	O	O
I am familiar with NCTM's Mathematical Teaching Practices.	O	O	O	O
I sometimes doubt my ability to evaluate math teachers.	O	O	O	O

5. With which gender identity do you most identify?

O Female
O Male
O Transgender female
O Transgender Male
O Gender variant/non-conforming
O Other (please specify) _____
O Prefer not to answer

6. What is your age in years?

	0 10 20 30 40 50 60 70 80 90 100
Age	

7. Are you of Hispanic, Latino, Or Spanish origin?

- O Yes
- O No

8. What is your ethnicity? Check all that apply.

- ☐ American Indian or Alaskan Native
- ☐ Black or African American
- ☐ Native Hawaiian or other Pacific Islander
- ☐ Asian American/Asian
- ☐ White
- ☐ Other (Please specify) _____

9. What is your highest level of education so far?

- O Bachelors
- O Masters
- O Specialist
- O Doctorate

10. Do you have a degree in mathematics (that is, a full major in math)?

- O Yes
- O No (Please specify your undergraduate major field.) _____

11. How many years of *grades 6-12 math* teaching experience do you have?

_____

12. Please complete the following: I am a principal in a city/town whose population is...

- O Greater than 500,000.
- O Greater than 100,000 but less than 500,000.
- O Greater than 50,000 but less than 100,000.
- O Greater than 15,000 but less than 50,000.
- O Less than 15,000.

13. In what type of school are you a principal?

- O Middle school
- O Junior high
- O High school
- O K-8 school
- O K-12 school
- O 6-12 school
- O other (please specify) _____

14. In what type of school do you work?

- O Public
- O Private non parochial
- O Parochial
- O Charter
- O Other (please specify) _____

Appendix C – Effective Mathematics Teaching Practices (NCTM)

1. Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
2. Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
3. Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

4. ***Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.***
5. Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
6. Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
7. Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
8. Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.